

What is claimed is:

1. An integrated speed reducer and gerotor pump assembly comprising:

a speed reducer configured for receiving torque at an elevated speed and

5 increasing the torque to a reduced speed;

a gerotor pump coupled with the speed reducer for receiving the torque at the reduced speed for pumping fluids.

2. An integrated speed reducer and gerotor pump assembly as described in claim 1, wherein the speed reducer comprises:

10 a carrier having a plate and a spindle defining a spindle bore, a spindle slot, and pin holes;

at least one bearing affixed to the spindle;

a sun roller having an input end for receiving torque and a first raceway;

15 at least one bearing affixed to the sun roller and engaged with the spindle bore so that the sun roller rotates freely within the spindle bore and the first raceway is aligned with the spindle slot;

a planetary roller having an inner surface and a second raceway;

20 a support bearing having an outer race and an inner race, such that the outer race of the idler bearing engages the inner surface of the planetary roller allowing the planetary roller to rotate freely;

an elastic insert having an outer surface and an center hole, such that the outer surface of the elastic insert engages the inner race of the support bearing;

a pin shaft engaged with the center hole of the elastic insert and inserted into the pin holes, such that the planetary roller, support bearing, and elastic insert are assembled within the spindle slot and the second raceway engages the first raceway transferring torque from the first raceway to the second raceway;

5        an outer ring supported on the spindle of the carrier by at least one bearing having a front face, a back face, and a third raceway eccentric to the first raceway engaged with the second raceway so that torque is transferred from the second raceway to the third raceway and thereby converted to torque; and

10        an output plate shaft having a base plate affixed to the front face of the outer ring, and a driving shaft coupled with the gerotor pump so that the driving shaft transfers torque at a reduced speed from the outer ring to the gerotor pump.

3.        An integrated speed reducer and gerotor pump as described in claim 1, wherein the gerotor pump comprises:

15        a housing having a chamber, a recessed seat, a center hole, a gear bore eccentric to the center hole, a front face, and a back face affixed to the carrier such that the speed reducer and the gerotor pump share the housing;

20        an end cover having a mounting face affixed to the front face of the housing, an inlet chamber, an outlet chamber, an inlet port for communicating fluid to the inlet chamber, and an outlet port for communicating fluid from the outlet chamber;

a seal seated within the recessed seat of the housing to prevent the transfer of fluids between the gerotor pump and the speed reducer;

a ring gear rotatably seated within the gear bore of the housing having a plurality of internal teeth;

a rotor having a center hole engaged with the speed reducer for receiving torque at a reduced speed thereby rotating the rotor and a plurality of external  
5 teeth which engage the internal teeth of the ring gear forming pumping chambers which communicate fluid from the inlet chamber to the outlet chamber as the rotor rotates.

4. A speed reducer as described in claim 2, further comprising traction fluid.

10 5. A speed reducer as described in claim 2, wherein the output plate shaft further comprises openings in base plate for circulating the traction fluid.

/ 6. An integrated speed reducer and gerotor pump assembly comprising:

a motor providing torque at an elevated speed;

15 a speed reducer configured for receiving torque at an elevated speed and increasing the torque to a reduced speed;

a gerotor pump coupled with the speed reducer for receiving the torque at the reduced speed for pumping fluids.

20 7. An integrated speed reducer and gerotor pump assembly as described in claim 6, wherein the speed reducer comprises:

a carrier having a plate and a spindle defining a spindle bore, a spindle slot, and pin holes;

at least one bearing affixed to the spindle;

a sun roller having an input end coupled with the motor and a first raceway;

at least one bearing affixed to the sun roller and engaged with the spindle bore so that the sun roller rotates freely within the spindle bore and the first  
5 raceway is aligned with the spindle slot;

a planetary roller having an inner surface and a second raceway;

a support bearing having an outer race and an inner race, such that the outer race of the support bearing engages the inner surface of the planetary roller allowing the planetary roller to rotate freely;

10 an elastic insert having an outer surface and an center hole, such that the outer surface of the elastic insert engages the inner race of the support bearing;

a pin shaft engaged with the center hole of the elastic insert and inserted into the pin holes, such that the planetary roller, support bearing, and elastic insert are assembled within the spindle slot and the second raceway engages  
15 the first raceway transferring torque from the first raceway to the second raceway;

an outer ring supported on the spindle of the carrier by at least one bearing having a front face, a back face, and a third raceway eccentric to the first raceway engaged with the second raceway so that torque is transferred from the  
20 second raceway to the third raceway and thereby converted to torque; and

an output plate shaft having a base plate affixed to the front face of the outer ring, and a driving shaft coupled with the gerotor pump so that the driving

shaft transfers torque at a reduced speed from the outer ring to the gerotor pump.

8. An integrated speed reducer and gerotor pump as described in claim 6, wherein the gerotor pump comprises:

5 a housing having a chamber, a recessed seat, a center hole, a gear bore eccentric to the center hole, a front face, and a back face affixed to the carrier such that the speed reducer resides within the chamber;

an end cover having a mounting face affixed to the front face of the housing, an inlet chamber, an outlet chamber, an inlet port for communicating  
10 fluid to the inlet chamber, and an outlet port for communicating fluid from the outlet chamber;

a seal seated within the recessed seat of the housing to prevent the transfer of fluids between the gerotor pump and the speed reducer;

a ring gear rotatably seated within the gear bore of the housing having a  
15 plurality of internal teeth;

a rotor having a center hole engaged with the speed reducer for receiving torque at a reduced speed thereby rotating the rotor and a plurality of external teeth which engage the internal teeth of the ring gear forming pumping chambers which communicate fluid from the inlet chamber to the outlet chamber as the  
20 rotor rotates.

✓ 9. An integrated speed reducer and gerotor pump assembly comprising:

a motor providing torque at an elevated speed;

a carrier having a plate and a spindle defining a spindle bore, a spindle slot, and pin holes;

at least one bearing affixed to the spindle;

5 a sun roller having an input end coupled with the motor and a first raceway;

at least one bearing affixed to the sun roller and engaged with the spindle bore so that the sun roller rotates freely within the spindle bore and the first raceway is aligned with the spindle slot;

a planetary roller having an inner surface and a second raceway;

10 a support bearing having an outer race and an inner race, such that the outer race of the support bearing engages the inner surface of the planetary roller allowing the planetary roller to rotate freely;

an elastic insert having an outer surface and an center hole, such that the outer surface of the elastic insert engages the inner race of the support bearing;

15 a pin shaft engaged with the center hole of the elastic insert and inserted into the pin holes, such that the planetary roller, support bearing, and elastic insert are assembled within the spindle slot and the second raceway engages the first raceway transferring torque from the first raceway to the second raceway;

20 an outer ring supported on the spindle of the carrier by at least one bearing having a front face, a back face, and a third raceway eccentric to the first raceway engaged with the second raceway so that torque is transferred from the second raceway to the third raceway and thereby converted to torque; and

an output plate shaft having a base plate affixed to the front face of the outer ring, and a driving shaft coupled with the gerotor pump so that the driving shaft transfers torque at a reduced speed from the outer ring to the gerotor pump;

- 5 a housing having a chamber, a recessed seat, a center hole, a gear bore eccentric to the center hole, a front face, and a back face affixed to the carrier such that the speed reducer resides within the chamber and the driving shaft extends through the center hole of the housing;

an end cover having a mounting face affixed to the front face of the  
10 housing, an inlet chamber, an outlet chamber, an inlet port for communicating fluid to the inlet chamber, and an outlet port for communicating fluid from the outlet chamber;

a seal seated within the recessed seat of the housing to prevent the transfer of fluids between the gerotor pump and the speed reducer;

- 15 a ring gear rotatably seated within the gear bore of the housing having a plurality of internal teeth;

a rotor having a center hole engaged with the speed reducer for receiving torque at a reduced speed thereby rotating the rotor and a plurality of external teeth which engage the internal teeth of the ring gear forming pumping chambers  
20 which communicate fluid from the inlet chamber to the outlet chamber as the rotor rotates.

10. A integrated speed reducer and gerotor pump assembly as described in claim 9, further comprising traction fluid.

11. A integrated speed reducer and gerotor pump assembly as described in claim 9, wherein the output plate shaft further comprises openings in base plate for circulating the traction fluid.

12. An integrated speed reducer and gerotor pump assembly  
5 comprising:

a speed reducer configured to receive torque at an elevated speed and to increase the torque at a reduced speed, the speed reducer further including;

a sun roller having a first raceway;

a planetary roller having a second raceway;

10 an outer ring having a third raceway eccentric to the first raceway so that the second raceway of the planetary roller engages frictional contacts with the first raceway of the sun roller and the third raceway of the outer ring for transferring torque between the sun roller and outer ring;

a gerotor pump coupled with the speed reducer for receiving torque at the  
15 reduced speed for pumping fluids, the gerotor pump further including;

a housing for hosting both the gerotor pump and the speed reducer;

a rotor having external teeth;

a ring gear eccentric to the rotor having internal teeth wherein the ring gear has more internal teeth than the rotor has external teeth.

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